

and rated. She is inclined to bully small dogs, even those she knows well, especially of the weaker sex.

Her intelligence is considerable and though still shy of men and of strangers she shows affection for me and follows me well both on foot and when riding.

As an instance of her retentive memory the following anecdote may be of interest. When she was quite a small puppy a rather short tempered fox-terrier was sent me to take care of during the summer. This dog attacked her on one occasion and bit off the tip of her ear. Several months later when she had grown to nearly full size the dog and his owner were walking round the Kennels, when the latter asked me to let 'Jungly' loose. Without thinking I did so and she at once savaged the little dog, which she undoubtedly remembered, and was with difficulty prevented from killing him. Since then she has always been suspicious of white dogs, and is generally inclined to attack dogs of that colour, though usually indifferent to others unless excited or aggrieved herself.

From regular feeding and the care taken of her 'Jungly' has grown a good deal heavier than the "wild specimen" killed this year in Gilgit and sent to the Museum. Her coat also is not quite so dark, but in all other respects she appeared to me identical when they were compared. Her weight and measurements are as follows:—

Dimensions. Head and body 43 inches, tail without hair $13\frac{1}{4}$, with hair $14\frac{3}{4}$; Tarsus and hind foot, anterior aspect=7 inches, posterior aspect=9 inches; Height at shoulder 24 inches; round skull and jaws in front of ears over hair 18 inches. Weight=about 60 lbs.

VII.—*New species of Indian Hymenoptera.*—By MAJOR C. G. NURSE.

[Read 6th November, 1901.]

I venture to send descriptions of some new species of *Apidæ*, which neither Mr. P. Cameron nor I have been able to identify with any described species. These are a portion of my collection of *Hymenoptera* made during the past three or four years, some of which have already been described by Colonel Bingham and Mr. Cameron, and the latter is still engaged in working out the remainder. I obtained altogether some 450 species, counting only the families dealt with by Colonel Bingham in his *Hymenoptera*, Vol. I of the Fauna of British India Series, and of these nearly a fourth appear to be hitherto undescribed.

1. HALICTUS KRISHNA, n. sp.

♂. Head and thorax closely and finely punctured, basal segment of

abdomen impunctate, remaining segments with minute shallow punctures; cordate space at the base of median segment reticulate in the centre, the sides with oblique divergent striæ; margins of abdominal segments in most specimens somewhat constricted. Dark bronze-green, basal half of antennæ black, becoming reddish-brown at apex; pubescence greyish-white; wings hyaline, with a slight fulvous tint, nervures and tegulæ testaceous.

♂. Similar; apex of clypeus pale testaceous.

Hab. Simla; Kashmir.

Length 5-7 mm.; Exp. 9-11 mm.

2. *HALICTUS CLARUS*, n. sp.

♀. Head and thorax very minutely and closely punctured, the punctures apparent only under a strong glass, clypeus with a few coarse punctures; enclosed space at the base of median segment finely reticulate, the segment concavo-truncate at apex; abdomen impunctate, the segments slightly constricted. Black and shining, where not hidden by pubescence; flagellum of antennæ more or less red, the apices of the abdominal segments testaceous, tibiæ and tarsi of the anterior legs, and femora, tibiæ and tarsi of the median and posterior legs, honey-yellow; pubescence greyish-white, short, but especially dense on the head, scutellum, and basal margins of the abdominal segments; wings clear Hyaline, nervures and tegulæ pale testaceous.

Hab. Deesa.

Length 6mm.; Exp. 12mm.

3. *HALICTUS FULGENS*, n. sp.

♀. Head finely and closely, thorax more sparsely, punctured, abdomen almost impunctate; cordate space at base of median segment finely reticulate, very convex, its apex forming a distinct ridge; clypeus much produced, transverse at apex. Jet black and shining, very thinly covered with greyish pubescence, which becomes more dense on the legs. In some specimens the apices of the abdominal segments are testaceous; wings hyaline, nervures and tegulæ testaceous.

♂. Similar, the base of first abdominal segment constricted, pubescence on the legs testaceous.

Hab. Simla.

Length 6-7mm.; Exp. 14mm.

This species resembles *H. nireus*, Biingham, (Jour. B., Nat. Hist. Soc. Vol. XII p. 124) but is a smaller and slighter insect, the clypeus is more produced, and thorax is sparsely and not closely punctured. I have a long series of each species, and they are readily separable.

4. *HALICTUS TESTACEUS*, n. sp.

♀. Head and thorax finely and closely punctured, abdomen with shallower punctures, cordate space at base of median segment reticulate. Head and thorax black, antennæ reddish-brown, legs and abdomen testaceous, becoming paler on the apical margins of the abdominal segments and on the tarsi; pubescence greyish and somewhat sparse; wings hyaline, nervures and tegulæ testaceous.

Hab. Simla.

Length 4-5 mm.; Exp. 10 mm.

5. *NOMIA SHIVA*, n. sp.

♀. Head somewhat coarsely punctured, the punctures running into striæ on the sides of the clypeus; thorax more closely and finely punctured, abdomen almost impunctate; enclosed space at base of median segment longitudinally striate; three longitudinally impressed lines on mesonotum, the outer two very faint. Black, the pubescence greyish-white, dense on the clypeus and front as far as the base of the antennæ, on the pronotum, postscutellum, legs, and apical margins of abdominal segments, on the latter forming broad bands. The apical margins of the abdominal segments when denuded of pubescence are pale, almost testaceous; wings hyaline, apical margins faintly fuscous; nervures and tegulæ testaceous.

Hab. Deesa; Ferozepur.

Length 8-9 mm.; Exp. 15-16 mm.

6. *NOMIA HIMALAYANA*, n. sp.

♀. Head closely and somewhat coarsely punctured, the punctures on the apex of the clypeus running into striæ; mesonotum and abdomen finely and closely, median segment more sparsely punctured; space at the base of median segment longitudinally striate; head with an impressed line from near base of antennæ to anterior ocellus. Black, the pubescence rich fulvous, and very dense on the mesonotum, scutellum, and postscutellum, pale fulvous and less dense on the head, legs, and margins of the abdominal segments; wings hyaline, nervures and tegulæ testaceous.

♂. Similar, the pubescence thinner, and, except on the thorax, almost cinereous. Posterior femora and tibiæ comparatively small.

Hab. Simla.

Length 7-8 mm.; Exp. 18 mm.

7. *NOMADA FLAVOZONATA*, n. sp.

♀. Head and thorax closely punctured, having a granular appearance, abdomen shining and more finely punctured; enclosed

space at the base of median segment rugose in the centre, the sides with divergent striæ, which become very fine apically; head above base of antennæ concave; three longitudinally impressed lines on mesonotum, the outer two very faint; scutellum large and prominent. Red; the apex of the mandibles, a spot near the base of the antennæ, another round the ocelli, the enclosed space at the base, the sides below, of the median segment, and narrow apical bands on the first three abdominal segments, black; median transverse bands, narrowed in the centre, on abdominal segments 2—4, yellowish; the head sparsely, and the sides of the median segment more densely pubescent, the pubescence with a golden tinge; wings subhyaline and iridescent, their apices slightly infuscated, tegulæ red, nervures reddish-brown.

♂. Black; the clypeus, labrum, basal portion of the mandibles, front below the bases of the antennæ (except two narrow outwardly diverging lines from the base of antennæ to the sides of the clypeus) the tegulæ, scutellum, postscutellum, and broad medial bands on the abdominal segments yellow; legs yellow, except the inner portions of the intermediate and posterior femora, which are ferrugineous, and a black macula on the inside of the posterior tibiæ; scape of antennæ yellow below, black above, flagellum ferrugineous red, with a black spot on joints 2—5; clypeus and front, scape of antennæ, median segment, thorax below, and base of first abdominal segment, with white pubescence; wings slightly more hyaline than in the ♀.

Hab. Ferozepur.

Length ♀ 10 mm., ♂ 12 mm.; Exp. ♀ 18 mm., ♂ 21 mm.

8. *NOMADA LUCILLA*, n. sp.

♂. Head and thorax closely but not very finely punctured, enclosed space at base of median segment reticulate, abdomen impunctate, shining. Black; the labrum, mandibles except at apex, the apex of the clypeus and of the front on each side, and two irregular spots on each of the abdominal segments yellow, the spots on the second and sixth segments largest; flagellum of the antennæ reddish-brown; apices of the femora and the whole of the tibiæ of the intermediate and posterior legs ferrugineous; abdomen mottled with ferrugineous, giving it a bronzy appearance; clypeus and front with golden pubescence, thorax below and sides of median segment with somewhat sparse whitish pubescence; wings subhyaline, somewhat darker towards the apex of the forewing; a clear hyaline patch across fourth cubital and third discoidal cells; tegulæ ferrugineous-red, nervures black.

Hab. Simla.

Length 8 mm.; Exp. 15 mm.

9. *NOMADA PRISCILLA*, n. sp.

♀ ♂. Head and thorax closely but not very finely punctured, median segment and abdomen impunctate; postscutellum very prominent; an impressed line on the median segment, enclosed space at the base of the segment raised, sharply defined, convex, a few outwardly divergent striæ at base, slightly rugose. Red; the abdomen black and shining; two yellow spots on second, fifth and sixth segments; some specimens have a similar spot on the fourth segment, and in others the spots, except on the second segment, are obsolete; pubescence white, very sparse, longest on median segment; wings hyaline, apex infuscated, tegulæ red, nervures reddish-brown.

Hab. Deesa; Matheran.

Length 5 mm.; Exp. 10 mm.

10. *MEGACHILE CÆLIOXYSIDES*, Bingham.

This species was described by Bingham in the *Journal of the Bombay Natural History Society*, Vol. XII, Part I, from my specimens he described the ♀, as I had not then a ♂. The following is a description of the latter.

♂. Similar to the ♀, but more slender, the abdomen cylindrical, not tapering towards the apex; the margins of the segments strongly constricted, apical segment with several teeth; the anterior tarsi normal, not dilated.

11. *MEGACHILE VERA*, n. sp.

♀. Closely resembles *M. cælioxyssides*, Bingham, but is a somewhat robuster insect; it differs only in having the trochanters and femora of the intermediate and posterior legs blood-red, and the femora of the anterior legs dark-red.

♂. Resembles *M. cælioxyssides* of the same sex, except that the apices of the tibiæ and the whole of the tarsi of the anterior legs are pale testaceous, the first joint of the tarsi being somewhat dilated; the intermediate legs have the trochanters, femora, and the apex of the tibiæ, and the posterior legs the trochanters and femora light red; the pubescence, especially on the clypeus and front, has a golden tint.

Hab. Deesa; Matheran.

Length 7.9 mm.; Exp. 13-15 mm.

12. *MEGACHILE KATINKA*, n. sp.

♀. Closely resembles *M. cælioxyssides*, Bingham, but the pollen brush is light red, and not white.

♂. Resembles the same sex of *M. cælioxyssides*, except that the

apex of the abdomen is notched but not dentate; the pubescence has a yellowish tint, especially on the clypens and front.

Hab. Matheran.

Length 8-9 mm., Exp. 16-18 mm.

Although the above three species bear considerable superficial resemblance to one another as regards size and puncturing, the characters I have given render them readily separable. I have a long series of each of them, and these characters are constant in each species.

13. *MEGACHILE PATELLA*, n. sp.

♀. Head thorax and abdomen finely and closely punctured, having a granular appearance; clypeus broader than long, transverse anteriorly; an inwardly-curved tooth at each angle of the scutellum, basal segment of the abdomen very slightly constricted. Black; the pubescence white and very sparse, forming narrow bands on apical margins of abdominal segments 1-5, yellowish-red on the inside of the posterior tarsi; pollen-brush golden; wings hyaline, nervures and tegulæ black.

♂. Similar, but smaller.

Hab. Simla.

Length 6-7 mm.; Exp. 12-14 mm.

14. *MEGACHILE ULRICA*, n. sp.

♀. Head, thorax and abdomen closely punctured, having a granular appearance; apical margins of abdominal segments 2-5 depressed, the depressed portion with pubescent bands. Black, the legs variegated below with dark red; pubescence very sparse, pure white on the head and thorax, abdominal bands greyish-white; on the tarsi the pubescence is testaceous, and on the inside of the posterior tarsi golden-red; wings hyaline, tegulæ light red, nervures black.

Hab. Matheran.

Length 8 mm.; Exp. 14 mm.

15. *ANTHIDIUM SALTATOR*, n. sp.

♀. Head, thorax, and abdomen closely and finely punctured; head slightly broader than thorax, clypeus quadrilateral, its anterior margin transverse; abdomen nearly as broad as long. Pale yellow; the flagellum of the antennæ, tips of the tarsi, base of the scutellum, and broad bands on the apical margins of abdominal segments, light red: the tips of the mandibles, extreme base of the scape of the antennæ, the region of the ocelli, the central portion of the mesonotum (except two parallel yellow lines), and a line on the tibiæ, black; pubescence and pollen-brush white; wings hyaline, tegulæ yellow, with a red spot in the centre, nervures black.

♂. Similar; subapical segment with two, and apical segment with four teeth: a line on all the femora, and the whole of the posterior trochanters, black.

Hab. Deesa.

Length 8-9 mm.; Exp. 16-18 mm.

16. *ANTHIDIUM VIATICUM*, n. sp.

♀. Head, thorax and abdomen closely and finely, the sides of the clypeus and the face below the base of the antennæ more sparsely and shallowly punctured; clypeus hexagonal, the anterior margin transverse and dentate, eyes slightly convergent below. Black; two spots near the apical angles of the clypeus, the sides of the face below the base of the antennæ, an elongate spot on each side of the face behind the eyes, a similar spot on the basal margin of the mesonotum, the margins of the scutellum, four irregularly-quadrate spots on abdominal segments 1-4 and two similar spots on abdominal segments five and six, yellow; legs variegated black and yellow; pubescence sparse, greyish white, pollen-brush white with a fuscous tinge; wings subfuscous, tegulæ very large, testaceous-red with dull yellow margins, nervures black.

♂. Similar, larger; clypeus, entirely pale yellow, with shallow punctures, its apical margin non-dentate, the four quadrate spots on abdominal segments 1-5, sixth segment with a single coronet-shaped spot; apical abdominal segment with five teeth.

Hab. Matheran.

Length ♀ 7-8 mm., ♂ 9 mm.; Exp. ♀ 14-15 mm., ♂ 18 mm.

17. *CERATINA CEREÆ*, n. sp.

♀ ♂. Smooth and impunctate; eyes slightly emarginate, distinctly converging below, median segment somewhat long, anterior portion almost flat, apical portion steeply sloped; abdomen longer than the head and thorax united, basal segment constricted. Black: the clypeus, scape of the antennæ in front, the sides of the pronotum, two elongate spots on second and third abdominal segments, the whole of the tarsi and the greater part of the tibiæ of all the legs, bright yellow; antennæ reddish-brown; wings clear hyaline, tegulæ yellow, nervures very pale testaceous, except the postcostal nervure and that enclosing the radial cell, which are dark-brown.

Hab. Deesa.

Length 5-6 mm.; Exp. 10-11 mm.

18. *CERATINA MUSCATELLA*, n. sp.

♀ ♂. Smooth and shining, a few scattered punctures on the posterior margins of the head and on the mesonotum, third and following

abdominal segments finely and closely punctured; an impressed line along the centre of the mesonotum, median segment rounded posteriorly, steeply sloped, the enclosed space at its base very convex, and having a medial longitudinal carina. Black; a spot on the clypeus, a broad line from near the base of the antennæ along the inner orbit of each eye, a narrow line on the cheeks, an interrupted line on the pronotum, a spot below the tegulæ, two contiguous spots on the scutellum, and a spot at the base of the posterior tibiæ, pale yellow; the abdomen in some specimens more or less red; wings hyaline, tegulæ dark brown, nervures black.

Hab. Simla.

Length 7-8 mm.; Exp. 12-14 mm.

19. *CERATINA LOQUATA*, n. sp.

♀ ♂. Smooth and shining, the third and following abdominal segments and the enclosed convex space at the base of the median segment, minutely punctured; the abdomen increases in width towards the apex. Black; a \perp -shaped mark on the clypeus, a short line on each side of it, not quite touching the inner orbits of the eyes, a spot on the labrum, an interrupted line on the pronotum (absent in some specimens), a spot below the tegulæ, two small spots on the scutellum (often obsolete), a line on the tibiæ of the anterior legs, and a spot at the base of the tibiæ of the posterior legs, pale yellow, often with a reddish tinge; wings hyaline, sometimes with a slightly fuscous tinge, tegulæ reddish-brown, nervures black.

Hab. Simla.

Length 6-7 mm.; Exp. 12-13 mm.

20. *CÆLIOXYTUS TAURUS*, n. sp.

♀. Head and thorax strongly and closely, abdomen more minutely punctured, the punctures on the fourth and fifth abdominal segments being extremely fine and shallow, the sixth segment impunctate; clypeus broader than long, a conspicuous longitudinal carina on the mesonotum, teeth of the scutellum moderately long and acute, scutellum rounded posteriorly; abdomen with segments 2-4 depressed in the middle apical abdominal segment long, acutely pointed, with a medial carina, the ventral plate slightly longer than the dorsal. Black; the flagellum of the antennæ, the legs, apical abdominal segment above, and the whole of the abdomen below, dark red; Pubescence snow white, dense on the clypeus and front, on the cheeks, thorax and median segment below, forming bands on abdominal segments 1-5 above, these bands much widened laterally and below; on the inside of the posterior tibiæ and tarsi the pubescence is golden; wings hyaline, with a slight fuscous

tinge at apex, sometimes the whole wings have a fuscous tinge; tegulæ black, with a dark red spot in the centre; nervures black.

♂. Similar, the whole of the abdomen punctured; the apical segment with eight teeth, two lateral, four apical above, and two below; the abdomen below, except the apical segment, is black, not red.

Hab. Deesa.

Length ♀ 8-11 mm., ♂ 7-9 mm.; Exp. ♀ 14-18 mm., ♂ 12-14 mm.

VIII.—*Studies in the Chemistry and Physiology of the Tea Leaf. Part I.*
The Enzymes of the Tea Leaf.—By HAROLD H. MANN, B.Sc.

[Received November 27th; Read December 4th, 1901.]

The production of a food product from the leaves of plants is in actual practice of very rare occurrence. Except in the case of a few vegetables and potherbs, and of some leaves used only as narcotics and stimulants, it may be said not to exist except in the case of tea. And in the production of tea, if the type of leaf used, the method of collection, the induction by artificial means of a constant unnatural succession of young growing shoots be taken into consideration, the whole question becomes of so exceptional a character that a study of the chemical and physiological condition prevailing under such circumstances would probably be extremely interesting. If, in addition, such a study be combined with that of the changes which take place in the leaf after plucking until its conversion into black tea,—changes which result in profound alterations in the substances present and which altogether alter the commercial characteristics of these products, the matter becomes one of great economic importance. In the series of papers I hope to contribute to the Asiatic Society on this subject, and of which this is the first, I shall try, however, to very largely eliminate the direct economic interest, which will be reserved for another place and another occasion.

In order, however, to follow the subject it will be necessary to give a short account of the processes by which tea is produced. The tea leaf as used in this manufacture consists of the youngest leaf on the plant, and only the youngest two open leaves on each shoot together with the unopened leaf bud are now usually plucked. This necessitates, if a large amount of leaf is not to get too old for plucking, and hence to be wasted, that every bush should be gone over by an expert plucker about every seven days. Having obtained the leaf in this manner, it is allowed to wither—to lose its turgescence—by exposure in very thin layers to air as cool as possible until the whole has got to such a condition that on rubbing in the hand the leaves no